

FORM PTO-1390

U.S. Department of Commerce Patent and Trademark Office

Attorney's Docket No.

**TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371**

2495-105

U.S. Application No. (if known, see 37 CFR 1.55)

09/786233

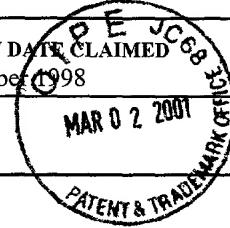
INTERNATIONAL APPLICATION NO.
PCT/AU99/00729

INTERNATIONAL FILING DATE
6 September 1999

PRIORITY DATE CLAIMED
4 September 1998

TITLE OF INVENTION
INDICATING THE TIME INTERVAL BETWEEN GROUPS OF GOLFERS

APPLICANT(S) FOR DO/EO/US
Patrick MCCULLAGH




Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☒ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has **NOT** expired.
 - d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

ITEMS 11. TO 16. below concern other document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment.
☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☐ Other items or information:

U.S. APPLICATION NO. (If known, see 37 CFR 1.50) 09/786233		INTERNATIONAL APPLICATION NO. PCT/AU99/00729		ATTORNEY DOCKET NO. 2495-105					
17. <input checked="" type="checkbox"/> The following fees are submitted: Basic National Fee (37 CFR 1.492)(a)(1)-(5): Search Report has been prepared by the EPO or JPO \$ 860.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) \$ 690.00 No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) \$ 710.00 Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$ 1,000.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) \$ 100.00 ENTER APPROPRIATE BASIC FEE AMOUNT =				<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left; padding: 5px;">CALCULATIONS</th> <th style="text-align: left; padding: 5px;">PTO USE ONLY</th> </tr> <tr> <td style="height: 100px;"></td> <td></td> </tr> </table>		CALCULATIONS	PTO USE ONLY		
CALCULATIONS	PTO USE ONLY								
Surcharge of \$130.00 for furnishing the oath or declaration later than [] 20 [] 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$ 0.00					
Claims	Number Filed	Number Extra	Rate						
Total Claims	32-20 =	12	X \$18.00	\$ 216.00					
Independent Claims	3-3 =	0	X \$80.00	\$ 0.00					
Multiple dependent claim(s) (if applicable)			+ \$270.00	\$ 0.00					
TOTAL OF ABOVE CALCULATIONS =				\$ 1,216.00					
Reduction by 1/2 for filing by small entity, if applicable. Applicant claims small entity status.				\$ 608.00					
SUBTOTAL =				\$ 608.00					
Processing fee of \$130.00 for furnishing the English translation later [] 20 [] 30 than months from the earliest claimed priority date (37 CFR 1.492(f)).				+ \$ 0.00					
TOTAL NATIONAL FEE =				\$ 608.00					
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property.				+ \$ 0.00					
TOTAL FEES ENCLOSED =				\$ 608.00					
				Amount to be refunded	\$				
				charged	\$				
a. <input checked="" type="checkbox"/> A check in the amount of \$608.00 to cover the above fees is enclosed. b. <input type="checkbox"/> Please charge my Deposit Account No. 02-2135 in the amount of \$_____ to cover the above fees. A duplicate copy of this sheet is enclosed. c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 02-2135. A duplicate copy of this sheet is enclosed. d. <input type="checkbox"/> Payment by credit card. (Form PTO-2038 enclosed.) NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status. <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> SEND ALL CORRESPONDENCE TO: Jeffrey L. Ihnen Rothwell, Figg, Ernst & Manbeck 555 13th St., N.W. Washington, D.C. 20004 Phone: 202/783-6040 </div> <div style="width: 45%; text-align: right;">  Signature Jeffrey L. Ihnen Name 28,957 Registration Number </div> </div>									

09/786233
528 Rec'd PCT/PTC 02 MAR 2001

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE	<i>Application Number</i>	New Application (U.S. National Phase of PCT/AU99/00729 filed 6 September 1999)
	<i>Filing Date</i>	2 March 2001
	<i>First Named Inventor</i>	Patrick MCCULLAGH
	<i>Group Art Unit</i>	Unknown
	<i>Examiner Name</i>	Unknown
	<i>Attorney Docket Number</i>	2495-105
<i>Title of the Invention:</i> INDICATING THE TIME INTERVAL BETWEEN GROUPS OF GOLFERS		

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

Prior to examination, please amend the above-identified national phase application as indicated below.

IN THE CLAIMS:

Please delete claims 1-62 and substitute claims 63-94 on the following pages.

Copy of New Claims

63. (New) An apparatus for providing an indication of a time interval between a first group of people which is progressing about a course and a second group of people which is following the first group, the apparatus including:

an actuation means for providing respective actuating signals indicative of the presence of the first and the second group at a predetermined location on the course;

a calculation means being responsive to the actuating signals for providing a timing signal indicative of the time interval between the actuating signals; and

indicator means being responsive to the time signal for providing the second group with an indication of the time interval.

64. (New) An apparatus according to claim 1, wherein the indicator means is a display means.

65. (New) An apparatus according to claim 1, wherein the actuation means, the calculation means and the display means are disposed at the location.

66. (New) An apparatus according to claim 1, wherein the indicator means and one of the actuation means or the calculation means are disposed at the location.

1 67. (New) An apparatus according to claim 1, wherein two or more of the actuation means,
2 the indicator means and the calculation means are collectively packaged and carried with the
3 second group.

1 68. (New) An apparatus according to claim 1, wherein the groups include one or more
2 golfers and the course is a golf course.

1 69. (New) An apparatus according to claim 1, wherein the actuation means is located at the
2 predetermined location and the indicator means is disposed at or adjacent to the location for
3 displaying information indicative of the time interval when the second group is proximal to the
4 display means.

1 70. (New) An apparatus according to claim 1, including a plurality of actuation means which
2 are disposed at respective predetermined locations spaced apart on the golf course.

1 71. (New) An apparatus according to claim 1, wherein the locations are passed by the groups
2 during the normal course of play.

1 72. (New) An apparatus according to claim 1, wherein the calculation means includes a timer
2 for generating the time signal and transmitter means for communicating the time signal to the
3 indicator means.

1 73. (New) An apparatus according to claim 1, wherein the indication of the time interval
2 provided by the indicator means includes an indication as to whether the time interval is within a
3 predetermined acceptable range.

1 74. (New) An apparatus according to claim 1, wherein the indication of the time interval
2 provided by the indicator means includes a quantification of the time interval.

1 75. (New) An apparatus according to claim 1, wherein the indicator means is movable and is
2 carried by or moves with the second group.

1 76. (New) An apparatus according to claim 1, including a locating device for determining
2 the position of the second group and the time elapsed since the first group was at that position.

1 77. (New) An apparatus according to claim 1, wherein the actuation means includes an input
2 device for providing actuating signals upon the arrivals of the groups at the location.

1 78. (New) An apparatus according to claim 1, including a central unit wherein the actuating
2 units have communication means for allowing the transmission to the central unit of information
3 indicative of either the time interval or the actuating signal.

1 79. (New) An apparatus according to claim 1, wherein the groups have respective
2 identification devices and the input devices are responsive to the identification devices for
3 providing the respective actuating signals.

1 80. (New) An apparatus according to claim 17, wherein the identification device also
2 functions as an electronic score card.

1 81. (New) An apparatus for monitoring a first group of people and a second group of people,
2 the apparatus including:

3 a central unit;

4 a plurality of actuating means being disposed at respective spaced apart locations remote
5 from the central unit for providing both respective first signals in response to the first group of
6 people being at or proximal to the respective locations and respective second signals in response
7 to the second group of people being at or proximal to the respective locations;

8 calculation means being responsive to the respective first and second signals for
9 generating a third signal indicative of the time interval between the groups being at or proximal
10 to the respective locations;

11 communication means for allowing transmission of one or more of the first, second and
12 third signals between the central unit and one or more of the actuation means;

13 indicator means being responsive to the third signal for providing information indicative
14 of the time interval.

1 82. (New) An apparatus according to claim 19, wherein said indicator means is a display
2 means.

1 83. (New) An apparatus according to claim 19, further including an alarm adapted to provide
2 a warning if the time interval falls above a predetermined threshold.

1 84. (New) An apparatus according to claim 19, wherein each actuation means includes an
2 alarm and the central unit is responsive to the third signal for determining whether the time
3 interval falls above a predetermined threshold and, if so, communicates a fourth signal to the
4 respective actuation means to actuate the alarm.

1 85. (New) An apparatus according to claim 19, wherein the calculation means includes a
2 plurality of separate timing devices located at respective actuation means.

1 86. (New) An apparatus according to claim 1, wherein use is made of a single timer device.

1 87. (New) An apparatus according to claim 19, wherein the indicator means comprises a
2 plurality of displays located at or adjacent to respective actuation means to allow the group
3 proximal to that actuation means to view the information indicative of the time interval.

1 88. (New) An apparatus according to claim 19, wherein the indicator means comprises a
2 display at or adjacent to the central unit.

1 89. (New) An apparatus according to claim 19, wherein said actuating means includes a
2 detection means for detecting presence of the group at a marker.

1 90. (New) An apparatus according to claim 28, wherein said detection means is a mechanical
2 switch.

1 91. (New) An apparatus according to claim 27, wherein said marker is a flag stick.

1 92. (New) An apparatus according to claim 1, wherein said indicator means is adapted to be
2 disposed remote of said locations.

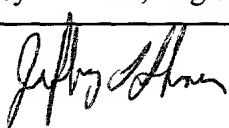
1 93. (New) An apparatus according to claim 42, wherein said indicator means is adapted to be
2 disposed remote of said locations.

1 94. (New) A method for establishing playing patterns of groups of golfers as they proceed
2 around a golf course, the method including the steps of:

- 3 a) providing a plurality of actuating means at points on the golf course which are
4 passed by the groups in the normal course of play, each of the actuating means including
5 an input device to automatically sense the passing or close proximity of groups of golfers;
- 6 b) providing a plurality of calculating means which include timing means and which
7 are responsive to the actuating means;
- 8 c) allowing the groups to progress around the course such that the actuating means
9 automatically senses the arrivals of successive groups of golfers;
- 10 d) as particular group approaches a location on the course at which the actuating
11 means is arranged to generated an actuating signal, calculating the time interval for the
12 particular group with reference to a group immediately preceding the particular group
13 under consideration; and
- 14 e) determining a playing pattern of the particular group based upon the time
15 intervals.

REMARKS

The claims have been rewritten to remove multiple dependencies and to more clearly claim the present invention. It is believed that these amendments do not constitute new matter.

RESPECTFULLY SUBMITTED,					
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24955...105.PA

TITLE: INDICATING THE TIME INTERVAL BETWEEN GROUPS OF GOLFERS
INTERVAL

Field of the Invention

5 The present invention relates to an apparatus for providing an indication of a time interval and in particular to an apparatus for providing an indication of a time interval between a first group of people which is progressing about a course and a second group of people which is following the first group.

The invention has been developed primarily for use at golf courses, and will
10 predominantly be described hereinafter with reference to that application. However, it will be appreciated that the invention is not limited to this particular field of use.

Background of the Invention

A common problem experienced when groups of people follow each other around a set course, for example at golf courses, is that some groups may be regarded by
15 other groups, and by the course management, as progressing too slowly. Various means of encouraging, and in some cases forcing, slow groups to speed up have been contemplated. However, these methods are frustrated by a fairly common belief among members of a slow group that they are not responsible for the slow progress as they are being held up by the group in front of them.

20 It is an object of the present invention to overcome or ameliorate at least one of the disadvantages of the prior art, or to provide a useful alternative.

Summary of the Invention

According to a first aspect of the invention there is provided an apparatus for providing an indication of a time interval between a first group of people which is

- 2 -

progressing about a course and a second group of people which is following the first group, the apparatus including:

an actuation means for providing respective actuating signals indicative of the presence of the first and the second group at a predetermined location on the course;

5 a calculation means being responsive to the actuating signals for providing a time signal indicative of the time interval between the actuating signals; and

indicator means being responsive to the time signal for providing the second group with an indication of the time interval.

In one embodiment the indicator means is a display means. In other
10 embodiments the indicator means includes sound generating means, such as a speaker, to provide an audible indication of said time interval.

Preferably, the actuation means, the calculation means and the display means are disposed at the location. In other embodiments the display means and one of the actuation means and the calculation means are disposed at the location. In further
15 embodiments the display means is disposed at the location and the actuation means and the calculation means are remote from the location. In other preferred embodiments, one or more of the actuation means, the display means and the calculation means are movable about the course. In yet another embodiment the said display means is adapted to be disposed remote of said location.

20 Preferably, one or more of the actuation means, the display means and the calculation means are collectively packaged and carried with the second group. More preferably, one or more of the actuation means, the display means and the calculation means are collectively packaged and carried with each group.

Preferably, the groups include one or more golfers and the course is a golf course. More preferably, the actuation means is located at the predetermined location and the display means is disposed at or adjacent to the location for displaying information indicative of the time interval when the second group is proximal to the display means. Even more preferably, the apparatus includes a plurality of actuation means which are disposed at respective predetermined locations spaced apart on the golf course. Still more preferably, the locations are passed by the groups during the normal course of play.

Preferably also, each location is at one of a respective: tee; green; fairway; between a green and a tee; or on a pathway traversed by the groups during the normal course of play.

Preferably, the calculation means includes a timer for generating the time signal and transmitter means for communicating the time signal to the display means.

In a preferred form the indication of the time interval provided by the display means includes an indication as to whether the time interval is within a predetermined acceptable range. Alternatively, or additionally, the indication of the time interval provided by the display means includes a quantification of the time interval.

Preferably, the display means is fixedly disposed at or adjacent to the location. In other embodiments, however, the display means is movable and carried by or moves with the second group. In some embodiments, the display means is integrated with an electronic score card or other such devices which may be used by the groups in the ordinary course of play.

Preferably also, the apparatus includes a locating device for determining the position of the second group and the time elapsed since the first group was at that position. More preferably, the locating device is a GPS unit.

In a preferred form, the actuation means includes an input device for providing
5 actuating signals upon the arrivals of the groups at the location. More preferably, the calculation means includes a timer which is responsive to the actuating signals for determining the time interval between the groups' arrivals. More preferably, each group comprises one or more members and the input device includes a button operable by one of those members. In another embodiment, the input device includes a magnetic key
10 operable by one of the members. In other embodiments, the input device automatically senses the presence of each group. In this case, the input device is preferably selected from one or more of the following: a force sensor such as a pressure pad or vibration sensor; an electromagnetic wave sensor; and an ultrasonic transducer.

Preferably also, the apparatus includes a central unit wherein the actuating units
15 have communication means for allowing the transmission to the central unit of information indicative of either the time interval or the actuating signal.

Preferably, the groups include respective identification devices and the input devices are responsive to the identification devices for providing the respective actuating signals. More preferably, the identification devices contain data in an electronic or
20 magnetic form and the input devices include a respective electronic or magnetic reader for reading the data. More preferably, the identification devices are selected from the following: magnetic keys; SMART cards; swipe cards; or electromagnetic transponders. Preferably, in embodiments where the identification devices are transponders, those transponders are mounted to respective golf carts. More preferably, the display means

are also mounted to respective carts. In other embodiments, however, the identification device is hand held, belt mounted or mounted on a golf bag.

In a preferred form the identification device also functions as an electronic score card.

5 Preferably, the identification device is a hand held radio transmitter which includes a keypad for the golfers in the respective group to enter their scores for the hole just completed. More preferably, the data, once entered, is transmitted to a central processing site. Even more preferably, the timing of the transmission is used by the actuation means to effect generation of the actuating signal.

10 Preferably also, the calculation means and the display means are located adjacent to the location. In other embodiments, however, the calculation means and the display means are collectively packaged and are carried by or move with the second group.

 In a preferred form, one person in the respective groups, upon reaching an actuation means, enters a previously allocated unique identifying number before an
15 actuating signal will be generated.

In some embodiments, the calculation means moves around the course with the group. The calculation means may be on a golf cart or hand held. The calculation means might be integrated with an electronic score card.

 Preferably, the actuation means, the calculation means and the display means are
20 contained within a single housing. More preferably, the housing is movable and is carried by or moves with the second group as they progress. Even more preferably, the apparatus includes a GPS unit for providing positioning information and for actuating the actuating means when the group is at or adjacent to the predetermined location.

Preferably also, the first group is following a third group around the course and the display means provides an indication of the time interval between the third group and the first group arriving at the location. Some embodiments are adapted to record successive time intervals between a plurality of separate groups.

5 According to a second aspect of the invention there is provided an apparatus for monitoring a first group of people and a second group of people, the apparatus including:

a central unit;

a plurality of actuating means being disposed at respective spaced apart locations remote from the central unit for providing both respective first signals in response to the
10 first group of people being at or proximal to the respective locations and respective second signals in response to the second group of people being at or proximal to the respective locations;

calculation means being responsive to the respective first and second signals for generating a third signal indicative of the time interval between the groups being at or
15 proximal to the respective locations;

communication means for allowing transmission of one or more of the first, second and third signals between the central unit and one or more of the actuation means;

display means being responsive to the third signal for providing information
20 indicative of the time interval.

Preferably the indicator means is a display means for displaying information indicative of said time interval.

Preferably, the apparatus includes an alarm and the central unit is responsive to the third signal for determining whether the time interval falls above a predetermined

threshold and, if so, communicates a fourth signal to the respective actuation means to actuate the alarm. Preferably also, the alarm is audible. More preferably, the alarm is visual. Even more preferably, the alarm is both audible and visual.

In a preferred form, the calculation means includes a plurality of separate timing
5 devices located at respective actuation means. In other embodiments use is made of a single timer device. Preferably, the single timer device is located at the central unit. However, in some embodiments, the single timer device is located at one of the actuation means.

Preferably also, the display means includes a plurality of displays located at or
10 adjacent to respective actuation means to allow the group proximal to that actuation means to view the information indicative of the time interval. More preferably, the display means includes a display at or adjacent to the central unit. Even more preferably, the central unit is an actuating means.

In some embodiments, the apparatus allows selective cancellation of the
15 automatic detection of one or more persons. This feature is advantageous in circumstances, say, where the course manager is inspecting the displayed time interval information for groups of golfers in those cases in which the display means is located adjacent to the actuation means. This feature might also be used by ground staff as they move past automatic actuation means while performing their work. This cancelling
20 function might be manual, initiated by the pressing of a button or use of a magnetic key or the turning of a key or the pressing of an infrared or radio remote control unit. This cancelling function might also be automatic, initiated by a transponder carried by or moving with the course manager or ground staff.

In some embodiments, the display includes an indication of the target time interval between groups. Such a target time interval might be set by manual button press, by magnetic reed switch or via an infrared or radio interface with the apparatus.

According to another aspect of the invention there is provided a method for
5 establishing playing patterns of groups of golfers as they proceed around a golf course, the method including the steps of:

- 10 a) providing a plurality of actuating means at points on the golf course which are passed by the groups in the normal course of play, each of the actuating means including an input device to automatically sense the passing or close proximity of groups of golfers;
- b) providing a plurality of calculating means which include timing means and which are responsive to the actuating means;
- c) allowing the groups to progress around the course such that the actuating means automatically senses the arrivals of successive groups of
15 golfers;
- d) as a particular group approaches a location on the course at which the actuating means is arranged to generate an actuating signal, calculating the time interval for the particular group with reference to a group immediately preceding the particular group under consideration; and
- 20 e) determining a playing pattern of the particular group based upon the time intervals.

As used in the present document, a person proceeding around a course on his or her own falls within the scope of terms like "group of people" or "group of golfers".

Additionally, it is to be understood that a golf course includes a number of holes which

are sequentially played by the golfers. Each hole includes a tee and a green. Most holes include a fairway extending between the tee and the green.

Brief Description of the Drawings

Preferred embodiments of the invention will now be described, by way of

5 example only, with reference to the accompanying drawings, in which:

Figure 1 is a diagrammatic plan view of a portion of a golf course incorporating a system according to a first aspect of the invention;

Figure 2 is a front view of the display face of the system of Figure 1;

Figure 3 is a perspective view of an alternative metering unit which is mounted
10 next to a path which golfers follow on the course;

Figure 4 is a perspective view of another metering unit;

Figure 5 is a front view of a display face of the metering unit of Figure 4;

Figure 6 is a side elevation of another metering unit;

Figure 7 is a front elevation of the metering unit of Figure 6;

15 Figure 8 is a front view of a display face of the unit of Figure 7;

Figure 9 is a schematic diagram of the control circuitry for the unit of Figure 4;

Figure 10 is a schematic depiction of a preferred system in accordance with the second aspect of the invention;

Figure 11 is a schematic side view of two golf carts according to one
20 embodiment of the invention;

Figure 12 is a schematic side view of the golf carts of Figure 11 at a later time;

Figure 13 is a plan view of a display means for use with the carts of Figure 11;

Figure 14 is a schematic perspective view of another apparatus according to the invention;

Figure 15 is a block diagram of the circuitry included within the apparatus of Figure 14;

Figure 16 is a schematic perspective view of a further apparatus according to the invention; and

5 Figure 17 is a sectional view through the apparatus of Figure 16.

Detailed Description of the Invention

Referring to Figure 1, there is illustrated a system 1 for recording a time interval between a first group of golfers and a second group of golfers. System 1 includes two spaced apart metering units 2 and 3 located adjacent to tees 4 and 5 on successive holes
10 of a golf course 6. Units 2 and 3 are responsive to the groups of golfers so as to determine the time interval between the groups arriving at or being located proximal to the respective tees. As best shown in Figure 2, display means, in the form of a display face 7, is mounted to respective units 2 and 3 for responding to the respective units to display information indicative of the time interval between the groups.

15 System 1 determines and records the time interval between the first group of people and a second group of people as they proceed around course 6. In other embodiments the group is involved in an activity other than golf.

While in this embodiment units 2 and 3 are disposed adjacent to respective tees 4 and 5, in other embodiments differing locations are utilised. Preferably, however, the
20 locations are those that are likely to be passed only once by the groups of golfers in a normal round of golf at the particular course.

Each of units 2 and 3 is activated by one or more of the golfers in the group to record the time interval between the respective groups at each of the given locations.

Units 2 and 3 are preferably locally powered electronic devices. In this embodiment use

is made of a rechargeable battery in combination with a solar collector (not shown). In other embodiments the units are connected to a mains power supply. In other embodiments the units are powered by a battery which is not rechargeable. In still other embodiments, the units are powered by combinations of two or more of these energy
5 sources.

Unit 3 includes an input mechanism in the form of a manually actuated button 12 which is disposed prominently and substantially centrally on face 7. The button is depressed by a member of each group of golfers to indicate that the group has progressed to that particular location on the golf course. In other words, as a group of golfers comes
10 across unit 3, a member of the group manually depresses button 12 to trigger unit 3 to calculate the time interval between the current group and the immediately preceding group. In other embodiments, a member of the group inserts an electronically readable card into a card reader at the actuation means. Unit 3 simultaneously commences the measurement of a new timing interval between the current group and the following
15 group.

In an alternative embodiment, unit 3 includes a timer which is sampled upon successive depression of button 12. The time interval is determined by a subtraction operation performed on the samples.

As best shown in Figure 2, face 7 is substantially rectangular and includes a
20 linear array of spaced apart windows 16, 17, 18 and 19 for visually displaying the respective timed intervals between the last five successive groups. In this embodiment the intervals are expressed in minutes and seconds. In other embodiments, however, the intervals are expressed as being either within or outside an acceptable range. For example, if a group has unacceptably fallen behind an immediately preceding group, a

red light is actuated to illuminate window 16. Alternatively, if the interval is sufficiently short then a green light illuminates window 16.

Although units 2 and 3 are illustrated as being included on two successive holes of course 6, in other embodiments they are located on two non-successive holes.

- 5 Moreover, in further embodiments, like actuation units are disposed on other holes to provide the groups with more frequent information on their progress with respect to preceding groups.

In another embodiment the display means are mounted to respective golf carts. That is, as the carts move into the proximity of one of the metering units, that unit
10 provides a signal to actuate the display means to provide the necessary indication to the group of the time interval and whether that interval is within an acceptable range.

Referring to Figure 11 and Figure 12, golf carts 70 and 73 are travelling past sensor unit 71 which is located at a fixed position on the golf course. Attached to golf carts 70 and 73 respectively are display means 72 and 74 which contain communication
15 devices. Sensor unit 71 contains a radio receiver and transmitter which allows it to detect the presence of radio transponders in display units 72 and 74 and hence to identify golf carts 70 and 73. Sensor unit 71 also contains a timer means and a memory means. In Figure 11, when sensor unit 71 detects the presence of golf cart 70, it records internally the time at which this detection occurred. In Figure 12, when sensor unit 71
20 detects the presence of the next golf cart 73, it calculates the time interval between this detection and the previous detection and uses radio communication to transmit this time interval and the previous three time intervals to display unit 74. Display unit 74 displays this time interval information on a display. In a similar fashion to the method of detection using stationary display units described above, in order to handle the case in

which a golf group consists of more than one golf cart, the sensor unit 71 is programmed to ignore the presence of a golf cart which is detected within a specified time limit after detection of the first golf cart. In order to reduce the likelihood of error in the time interval calculation due to the presence of stray golf carts, sensor unit 71 records the identity of each golf cart as it passes and also transmits this information to golf cart 73. In this way, if a stray cart is sensed by the sensor unit 71, its presence can be discarded for the purposes of calculating the appropriate time interval.

Figure 13 shows the face 82 of display units 72 and 73. As in the embodiments described earlier, face 82 includes an array of four spaced apart windows 83, 84, 85 and 86 for providing the golfers in the respective groups with an indication as to the time delay between the groups. In this embodiment, the windows are rectangular and provide a numeric display of the elapsed time between the arrivals of successive groups at unit 71. Each of windows 83, 84, 85 and 86 is flanked by adjacent outlines of a golf cart. One of the outlines, numbered 87, is filled in and represents the group present at or adjacent to unit 80.

Face 82 also includes a window 88 disposed beneath the other windows. This window displays the recommended maximum time delay for the group present at unit 80. In other embodiments, however, the window displays the current time.

In other embodiments of the display face, only a single time interval will be displayed. This would be the time associated with the golf cart on which the display unit under consideration was located. The time intervals of the successively preceding groups would not be displayed.

The use of system 1 raises the awareness of the golfers in the groups as to their speed of play relative to the speed of play of other groups of golfers using course 6.

This, in turn, encourages the golfers not to fall too far behind the preceding group, thereby alleviating, for following groups, some of the frustrations which result from slow play. Also, by providing an indication of the times between previous groups of golfers, it is intended firstly to counter the feeling among golfers that they are not responsible for the slow play since they are being held up by the golfers in front of them and, secondly, to counter any feeling of complacency among golfers that there is no evidence that they are in fact playing slowly. These same advantages are provided by the other embodiments of the invention described below.

In some embodiments units 2 and 3 include respective printers for providing a printed representation of face 7 including the intervals displayed through windows 16 to 19. In other embodiments, the time interval information which has been calculated for successive groups is able to be transferred to another electronic device for later analysis or printing out. This uploading is achieved by infrared or radio communication between the calculation means or the display means and an electronic device which might be movable or stationary.

In an alternative embodiment, such as that illustrated in Figure 3, unit 3 is mounted to a hollow post 9 which is adjacent to a path 10. The path leads from one putting green to the following tee. The input mechanism, which takes the form of a pressure pad 15 disposed immediately under path 10, automatically senses the presence of a group of people as they progress along the path. Pad 15 is linked to unit 3 by way of an electrical lead 20 which extends internally through post 9. In further embodiments the input mechanism is an electro-magnetic or other sensor. For example, an alternative actuation unit 21 is illustrated in Figure 4. More particularly, unit 21 includes an input mechanism in the form of an ultrasonic device 22 that detects the presence of one or

more persons in the proximity of the unit. The periphery of the field examined by device 22 is approximated by broken lines 23 and 24. As would be appreciated by those skilled in the art, device 22 is tuned for sensitivity and range.

In the Figure 4 embodiment, the passage of one or more of the golfers in the group into the field of examination will provide a trigger to unit 21 to stop timing the gap from the preceding group and to start timing the gap to the subsequent group. To avoid a repeat triggering by a group that has already been detected, unit 21 is configured to allow a predetermined period to pass from a triggering before a subsequent triggering will be detected. This predetermined period, in some embodiments, is varied in accordance with one or more of the following:

- the number of golfers using the course;
- the concentration of golfers using different parts of the course;
- the number of groups using the course;
- the number of people in a particular group; and
- other factors.

Unit 21 includes display means in the form of substantially planar display face 25. As shown in Figure 5, this face includes six generally rectangular transparent windows 31, 32, 33, 34, 35 and 36 which are aligned along their right most sides and which are adjacent to an edge of the face. Window 31 includes a larger area than the remainder of the windows for prominently displaying the time delay between the arrival of the proximal group and that of the immediately preceding group. The remainder of the windows are of equal area and display the delay between the arrivals of the successively preceding groups. Also included on face 25 is a series of printed indicia respectively arranged adjacent to the windows for providing the group with an indication

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as to the significance of the display in the windows. As shown, the windows allow one or more of the golfers in the group proximal to unit 21 to view a digital representation of the relevant time intervals.

Optionally, a printer (not illustrated) is linked to unit 21 to output a printed
5 record of the time intervals between successive groups. Preferably, the course utilises a plurality of like units 21 on separate holes and, as such, at the end of a round the group will have a corresponding plurality of printed records. In this embodiment, and to encourage the groups to progress about the course at a sufficient rate, the course administrators offer an incentive for the return of the records which indicate the group
10 was within a predetermined interval from the preceding group at all the measured points.

Figure 9 is a more detailed schematic representation of the various components within unit 21. In particular, the operation of the unit is centred around a microprocessor that is responsive to various inputs to provide the necessary outputs. The microprocessor includes a number of ports for allowing selective communication with other devices such
15 as remote like units or a central controller. The latter configuration will be expanded upon below with reference to Figure 10.

Another alternative actuation unit 40 is illustrated in Figures 6 and 7 where corresponding features are denoted by corresponding reference numerals. Particularly, unit 40 includes a body 41 for containing the necessary electronic circuitry and an
20 upwardly directed display face 42 which is fixedly mounted to body 41. As in the embodiments described above, face 42 includes an array of four spaced apart windows 43, 44, 45 and 46 for providing the golfers in the respective groups with an indication as to the time delay between the groups. In this embodiment, the windows are rectangular and provide a numeric display of the elapsed time between the arrivals of successive

groups at unit 40. Each of windows 43, 44, 45 and 46 is flanked by adjacent outlines of a golfer with a golf bag. One of the outlines, numbered 47, represents the group present at or adjacent to unit 40. The remainder of the outlines, when viewed from the left to the right of face 42, are progressively smaller in size. In some embodiments outline 47 is a window which is selectively illuminated to attract the attention of golfers in the group to unit 40.

In some embodiments one or more of the outlines is a silhouette of the golfer and a golf bag.

Face 42 also includes a window 48 disposed beneath the other windows. This window displays the recommended maximum time delay for the group present at unit 40. In other embodiments, however, the window displays the current time.

Unit 40 includes a tubular post 49 which extends between two ends 50 and 51. End 51 is fixed within the earth adjacent to the path of travel of the group of golfers, while end 50 supports body 41 at a fixed distance above the ground. Preferably, body 41 is disposed at or about waist height. As best shown in Figure 7, intermediate ends 50 and 51 is an array of apertures 53 and an adjacent planar reflector plate 54. Post 49 includes two interior channels separated by a common internal wall 52.

Unit 40 makes use of an ultrasonic beam to determine the presence or otherwise of the next group of golfers. The beam is directed from body 41 downwardly into one of the internal channels in post 49 toward plate 54. Once impinging plate 54 the beam is redirected through apertures 53 and away from post 49. Any reflected portion of the beam is then redirected by plate 54 and through the other of the internal channels back toward body 41 for subsequent processing. The use of two separate internal channels

reduces coupling of the input and output signals and, as such, reduces the risk of false readings.

An alternative system 60 is shown in Figure 10 for calculating a time interval between a first group of people and a second group of people. System 60 includes a
5 central unit 61 which is capable of communication with a plurality of remote and spaced apart actuation units 62, 63, 64 and 65. It will be appreciated that the term "central" when used in relation to unit 61 does not necessarily indicate a geographical centre. Moreover, although four actuation units are shown, in other embodiments a greater or lesser number of such units are used.

10 Units 62, 63, 64 and 65 are responsive to the passing or close proximity of groups of people for starting and stopping a timer (not illustrated) to calculate the relevant time intervals between different groups of people. For example, if it is necessary for system 60 to calculate the time interval between a first and second group, the actuation units firstly respectively determine the passing or close proximity of the
15 first group and starts the timer. Then, when the passing or close proximity of the second group of people to that same unit is determined, the timer is stopped. This function is as described with reference to the preceding embodiments. Additionally, however, system 60 provides for communication between units 62, 63, 64 and 65 and unit 61. In alternative embodiments units 62, 63, 64 and 65 do not include separate timers but,
20 rather, a single timer is included at unit 61. In this embodiment, unit 61 is responsive to the start and stop signals provided by the separate actuation units for determining the relevant delay between groups and communicating this to the respective actuation units for display.

System 60, as with the other embodiments, includes display means disposed at or near respective units 62, 63, 64 and 65. In some embodiments, however, the display means also allows a viewer at unit 61 to inspect the relevant time delays. The latter arrangement enables groups to proceed to unit 61 after completing the course to review the information indicative of the time intervals. It also allows the course management to track the progress of the various groups around the course and to take more active policing action if continued delays occur beyond what is deemed acceptable.

In some embodiments a printer (not illustrated) is linked either directly or remotely to either unit 61 or one or more of the units 62, 63, 64 and 65.

The preferred method for establishing playing patterns of groups of golfers as they proceed around a golf course includes the steps of:

- (a) providing a plurality of metering units at points on the golf course which are passed by the groups in the normal course of play, each of the units including sensing means to automatically sense the passing or close proximity of groups of golfers, the units further including timing means (not illustrated) responsive to the sensing means;
- (b) allowing the groups to progress around the course such that the metering units automatically record time intervals between successive groups of golfers;
- (c) as a particular group completes the course, compiling the time interval for the particular group with reference to a group immediately preceding the particular group under consideration; and
- (d) determining a playing pattern of the particular group based upon the time intervals. For example, the maintenance by a particular group of a fairly constant time interval from the immediately preceding group, would indicate that the group under consideration was proceeding around the course approximately as quickly as the

immediately preceding group. Alternatively, a progressive increase in the intervals between the group under consideration and the immediately preceding group would indicate that the group under consideration was proceeding more slowly than the immediately preceding group.

5 As used in this document, terms such as “groups of people” or “groups of golfers” refer not only to a plurality of people, but also to individuals proceeding around a course on their own.

 In other embodiments of the invention each group carries an identification device and the metering units include input devices that are responsive to the identification
10 devices for providing respective actuating signals. These actuating signals are used to determine the time interval between the arrivals of the successive groups at the respective locations.

 The identification devices contain data in an electronic or magnetic form and the input devices include respective electronic or magnetic readers for reading the data. For
15 example, in some embodiments the identification devices are magnetic keys, while in other embodiments the identification devices are SMART cards. It will be appreciated that other means of data storage and retrieval are known and applicable in other embodiments. Again, by way of example, further embodiments utilise identification devices in the form of transponders.

20 For those golf courses where use is made of golf carts, it is preferred that the identification devices are mounted to respective carts.

 A further embodiment requires that one person in the group, upon reaching an actuation unit, must enter a previously allocated unique identifying number before an actuating signal will be generated. This form of identification is used alone or in

combination with other identification such as the SMART card, a swipe card or other readable devices discussed above.

Reference is now made to Figure 9 which illustrates a block diagram of a preferred actuation unit. For convenience, a list of the features, together with their

5 corresponding reference numerals, are as follows:

	101	Switched power
	102	IRDA port
	103	RS-232 DB9
	104	RS-485 RJ12
10	105	IRDA I/O
	106	RS-232 I/O
	107	RS-485 I/O
	108	MUX
	109	Microcontroller oscillator
15	110	Microcontroller watchdog
	111	Clock
	112	Reset
	113	Microcontroller
	114	TXD
20	115	RXD
	116	Select
	117	I/O
	118	RTS
	119	CTS
25	120	Activity
	121	I/O
	122	TX/n.RX
	123	RST
	124	12C
30	125	I/O
	126	I/O
	127	XIN
	128	Switched power
	129	Auxiliary power
35	130	Isolated power converter
	131	Solar panel
	132	Battery charging and power control
	133	Gel-cell battery
	134	Control
40	135	Monitor
	136	A/D
	137	I/O
	138	12C
	139	12C

	140	A/D
	141	T/C
	142	Time
	143	Data
5	144	Real time clock
	145	EEPROM
	146	Filter and detector
	147	User display driver
	148	Displays
10	149	LED's
	150	Beeper
	151	Switched power
	152	TX drive
	153	Ultrasonic transmitter
15	154	Ultrasonic receiver
	155	RX amplifier
	156	Switched power
	157	TX amplifier

A more detailed description of individual features is set out below.

20 **Microcontroller 113**

The microcontroller 113 provides the main intelligence and processing capability of the unit. The major components of the microcontroller 113 are:

- Type: Single chip 8 bit microcontroller with embedded peripherals.
- Code Storage: At least 8 Kbytes of code storage space. OTP and mask
- 25 programmable variants to be supported.
- RAM: At least 256 bytes of on-board RAM.
- A/D: At least 2 A/D inputs each of at least 8 bits resolution (140 and 136).
- I2C: I2C interface (124, 138 and 139) to be supported as a master, or synthesised in firmware.
- 30 • UART: UART to support bi-directional asynchronous interface.
- Timer/Counter: Timer/Counter with PWM or overflow output capable of generating 1 millisecond bursts of 40 kHz tone.
- I/O ports (117, 121, 125, 126 and 137): At least 8 bi-directional I/O pins.

- Clock: Capable of operating from resonator or crystal clocks in the range 500 kHz to 10 MHz.
- Watchdog 110: Internal watchdog timer to be available.
- Power Supply: Capable of low current operation from power supplies down to 3 Vdc, with low current consumption standby modes available.
- Firmware: High level language support (preferably 'C').
- Emulation: Low cost or loan in-circuit emulation facilities to be available.

In other embodiments use is made of a microcontroller type or configuration different from the above.

10 **User Display 148**

The user display 148 provides the means by which the time gaps between successive groups of golfers are displayed. Six separate LCD displays are included, each providing four digits capable of displaying numeric values in 7-segment format. This allows the time to be displayed in MM:SS format. The display which presents the time interval from the first preceding group to the current group is larger than the other two displays, with a digit height of 15 to 20 mm being desirable. The displays which presents the time gap for subsequent groups of golfers (and the target time gap) are smaller, with a digit height of 8 to 12 mm being desirable. Different display sizes and different numbers of displays are used in alternative embodiments. However, cost or power consumption penalties can arise.

The display provides adequate contrast and a wide viewing angle over the specified operating temperature range of the unit. In this case the operating temperature is -10 °C to + 60 °C.

The display is driven by a multiplexing display driver device 147 with direct segment and backplane drive capability.

A backlight option is used for use in continuously powered applications.

User Display Driver 147

5 The user display driver 147 provides the interface between microcontroller 113 and display 148. The display driver 147 drives five separate LCD displays. Each of these displays includes 4 seven-segment digits plus a colon, giving a total of 29 segments per display or 87 segments in total.

10 The interface between the user display driver and the microcontroller is via the I2C bus 124.

A range of suitable display driver devices is available, including microcontrollers which provide this capability directly.

Ultrasonic Transmitter 153 and Driver 157

15 The ultrasonic transmitter 153 and driver 157 generates bursts of ultrasonic energy of duration 0.1 to 10 milliseconds at a nominal frequency of 40 kHz and a repetition rate between 1 and 10 bursts per second. The signal drive level is as high as possible with the available supply voltages.

Drive for the ultrasonic transmitter driver is directly from a microcontroller pin.

20 A range of ultrasonic transducer transmitter devices operating at various frequencies is available.

Ultrasonic Receiver 154, Amplifier 155, Filter and Detector 146

The ultrasonic receiver 154, amplifier 155, filter and detector 146 receive bursts of ultrasonic energy of duration 0.1 to 10 milliseconds at a nominal frequency of 40 kHz and a repetition rate between 1 and 10 bursts per second. From this is produced a signal

representative of the envelope of the burst for input to the microcontroller 113 via an A/D input 140.

Amplification and bandpass filtering of the 40 kHz signal produced by the ultrasonic receiver 154 is provided to maximise sensitivity. A threshold-free detection method is employed. Overall bandwidth allows detection of ultrasonic bursts of duration in the range 0.1 to 10 milliseconds. Receiver sensitivity is set as high as possible given the available supply voltages.

A range of ultrasonic transducer receiver devices operating at various frequencies is available.

10 **Battery Charging and Power Control 132**

Battery charging and control facilities are provided to allow operation of the unit from power supplied by a solar panel 131, with lead-acid "Gel-Cell" battery 133 as backup when insufficient power is available from the solar panel 131.

The battery charging configuration optimises the efficiency with which power from the solar panel 131 is used to power the unit and/or recharge the battery 133, from maximum power in direct sunlight to minimal power in deep shade. Provision is made to ensure that the battery 133 can not be over-charged.

The battery management configuration optimises the efficiency with which power from the battery is used to power the unit.

20 The microcontroller 113 monitors the total amount of power available from the solar cell to enable the unit to be deactivated in conditions of full or near darkness.

The microcontroller 113 monitors the amount of power being delivered from the solar cell 131 to the battery 133, and the state of charge of the battery 133, to allow warning of battery depletion to be presented via the user display 148.

The power control facility 132 allows power to be disconnected from idle sections of the unit, where this is required to minimise overall power consumption.

An auxiliary power connector 129 is provided to allow powering of the unit from an external power source. The unit is protected from over-voltage, reverse polarity
5 connections and transients on the auxiliary power connection. These measures include a high level of voltage isolation between the external power connection and the unit electronics.

As indicated above, a range of powering configurations is practical and would be known to those skilled in the art.

10 **Serial Interface**

The serial interface provides interfacing facilities for the microcontroller serial interface which is shared between external interfaces. This is effected by a multiplexer 108 which is controlled by the microcontroller 113. The external interfaces which are supported are:

- 15 • RS-232 Interface 106 which provides data signals TXD 114 and RXD 115, plus handshake signals RTS 118 and CTS 119. This is wired as DTE and fitted with a male DB9 connector 103. An RS-232 driver chip 106 which incorporates static discharge protection is also employed.
- 20 • RS-485 Interface 107 for use in networked deployments and which provides standard balanced RS-485 data signals. This interface employs an isolated driver which provides a high degree of voltage isolation between the RS-485 cabling and the microcontroller. Cabling connections to the driver provide transient protection and bypassing to ground. The RS-485 interface also employs an RJ12 connector 104 supporting bi-polar data signals and

communications earth. Additional pins on this connector allow for the connection of an external power supply to the unit.

- Infra-Red Interface 105 for user control and data upload which provides a full duplex bi-directional serial interface conforming to IRDA standards at the physical and link level interfaces. The interface supports other operating modes including amplitude modulated carrier systems used for appliance remote control, and unmodulated baseband asynchronous serial communications.

Any other type of interface could be used, including a serial modem connection, power line signalling or any other suitable method exhibiting reasonable range performance and robustness.

The provision by the microcontroller of additional serial interfaces would avoid the requirement to use a multiplexer 108 to share a single interface amongst multiple communications methods.

Auxiliary signals are connected between the receive data lines of each interface and the microcontroller to allow the microcontroller to detect activity on each interface when that interface is not selected as the microcontroller UART receive signal.

Microcontroller Oscillator 109

The microcontroller oscillator 109 provides the master clock signal to the microcontroller 113. Use is made of a ceramic resonator or quartz crystal device, operating in the range 500 kHz to 10 MHz, in conjunction with the microcontroller internal oscillator circuit.

Microcontroller Watchdog 110

The microcontroller includes a watchdog circuit which asserts microcontroller reset 123 whenever the microcontroller supply voltage falls below an acceptable level. A toggled type watchdog is used, which asserts reset when the microcontroller 113 fails to toggle the watchdog input for a prescribed period. This ensures that the

5 microcontroller 113 is reset in the event of loss of program control.

Real Time Clock 144

A real time clock 114 interfaces with the microcontroller 113 via the I2C bus 138. The real-time clock 144 derives timing from its own crystal, and includes local battery backup capability to provide power in the event of disconnection of main unit

10 power. For example, such a disconnection can occur during battery replacement or battery depletion.

Other types of real-time clock could be used.

EEPROM 145

EEPROM 145 of a minimum 256 bytes capacity interfacing to the

15 microcontroller via I2C bus 139 is used. A fitting option providing higher storage capacity of up to 16 Kbytes or more is also provided.

Other types and capacity of EEPROM could be used.

User LED's 149

At least two high intensity LED's, one red, one green, are used for visual

20 indication to users.

Other numbers and types of LED or other visual indicator are used in other embodiments.

Beeper 150

A beeper 150 for audible indication to users. Other types of audible indicator are used in alternative embodiments.

Firmware considerations

Some complexity results from the requirement to implement responsive
5 ultrasonic detection and ranging, whilst minimising average current consumption.
Overall power management requirements impose further complexity constraints.

Ultrasonic detection is achieved by transmitting a brief burst of ultrasonic energy for typically 1 millisecond and accumulating received ultrasonic energy as a function of time. As the return trip delay for ultrasonic transmissions is of the order of 30 cm per
10 millisecond, a 1 millisecond transmit duration and corresponding detector bandwidth allows ranging resolution of the order of 30 cm. Accordingly, a 3 metre range requires the received signal to be monitored for the order of 10 milliseconds.

In this embodiment the ultrasonic ranging system operates in two modes, namely Target Acquisition with a "ping" rate of about twice per second, and Target
15 Confirmation with a "ping" rate of about 10 times per second. During Target Acquisition, a positive indication of the presence of a target will cause the unit to enter Target Confirmation for a period of about 1 second, with averaging being used to confirm the presence of a target.

Once a target has been confirmed as present, the unit monitors for the departure
20 of the target by pinging at typically once per second. After a "dead" period, which is set as the minimum expected interval between groups, the unit then awaits the arrival of the next target which shall be considered to be the following group of players. The minimum interval between groups is adjustable.

The ultrasonic ranging technique includes a long term threshold or signal floor adjustment regime to allow static objects within range to be ignored. The signal floor rises and falls with time and is adjustable.

Adjustable signal averaging and filtering provisions are included in firmware to
5 allow the optimisation of detection reliability and responsiveness.

The described method of ultrasonic detection is suitable for the function but is not prescriptive. Other detection strategies and parameter settings are feasible.

All adjustable parameters are stored in EEPROM 145 in a redundant fashion with checksum protection. Facilities are provided to allow setting of parameters via a dumb
10 terminal connected to the unit's RS-232 interface 106, or via the RS-485 107 and/or infra-red interfaces 105 if fitted.

Facilities are provided to allow the following functions to be implemented:

- By use of an infra-red transmitting key, the unit operator is able to set the target interval between player groups.
- 15 • By use of an infra-red transmitting key, the unit operator is able to cancel the detection of his presence near the unit, to avoid disruption to player group interval determination.
- Storage of historical player group interval data, for display under control of the infra-red transmitting key.

20 These functions could be achieved by other means such as any of the interfaces provided, or a push button, or an internal reed switch and external magnet.

The hardware facilities provided by the unit allow many other facilities to be implemented, including but not limited to the following:

- Bi-directional communication via the infra-red interface with a device such as a PC, for the setting of operating parameters and uploading of historical player group interval records.
- Similar bi-directional communications via any of the cable-connected
5 interfaces provided.
- Communication via cable or a radio link with a central control facility typically comprising a PC, for unit control and real-time monitoring of player group intervals and activity around the golf course.

In view of the design objective to minimise unit current consumption so as to
10 allow solar powering, if the static current drain of any element when not in use is a significant factor in determining unit current consumption, provision is made to power down that element when not in use.

Reference is now made to Figure 14 and Figure 15 which illustrate another embodiment of the invention. Specifically, this particular hole of the course includes a
15 fairway 200 and a green 201 which include a common periphery 202. The green includes a cup 203 located within the periphery, said cup being the ultimate target for the golfers. Use is made of a marker 204 which includes a tubular flag stick 205 and a flag 206. Stick 205 extends between a first end 207 which is normally disposed within cup 203 and a second free end 208 which supports flag 206. A calculation and display
20 means 209 is disposed adjacent to but remote from green 201.

End 207 includes detection means in the form of a mechanical switch for providing a signal when end 207 is removed from cup 203. As shown in Figure 15, a circuit 210, which is mounted within stick 205, is responsive to the signal for providing an actuating signal to a circuit 211 which is disposed within calculation and display

means 209. That is, as the golfers remove stick 205 to complete their putting or replace stick 205 after completing their putting, the actuating signal will be generated. Thereafter the relevant calculations will be made and the desired information displayed on calculation and display means 209.

5 Preferably, the communications between circuits 210 and 211 is done at a radio frequency. However, in other embodiments other wireless transmissions are utilised.

An alternative embodiment to that of Figure 14 is illustrated in Figures 16 and 17 where corresponding features are denoted by corresponding reference numerals. More particularly, the detection means is in the form of two spaced apart contacts 215 and 216
10 which have a potential maintained between them. Cup 203 includes a metal base plate 217 which the contacts abut when end 207 of stick 205 is in the cup. When end 207 is removed from the cup, an open circuit condition is detected and the appropriate processing takes place to calculate the required time interval.

In this embodiment the calculation and display function are all mounted to stick
15 205. While the necessary calculation circuitry is located within the flag stick, the display means takes the form of a substantially horizontal circular cylinder 220 which extends normally outwardly from stick 205 intermediate ends 207 and 208. The cylinder supports an alpha numeric display (not shown) for informing the golfers of the relevant time interval.

20 Although the invention has been described with reference to specific examples, it will be appreciated by those skilled in the art that the invention may be embodied in many other forms.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. An apparatus for providing an indication of a time interval between a first group of people which is progressing about a course and a second group of people which is following the first group, the apparatus including:
 - 5 an actuation means for providing respective actuating signals indicative of the presence of the first and the second group at a predetermined location on the course;
a calculation means being responsive to the actuating signals for providing a timing signal indicative of the time interval between the actuating signals; and
indicator means being responsive to the time signal for providing the second
 - 10 group with an indication of the time interval.
2. An apparatus according to claim 1 wherein the indicator means is a display means.
3. An apparatus according to claim 1 wherein the actuation means, the calculation means and the display means are disposed at the location.
4. An apparatus according to claim 1 wherein the display means and one of the
- 15 actuation means or the calculation means are disposed at the location.
5. An apparatus according to claim 1 wherein the display means is disposed at the location and the actuation means and the calculation means are remote from the location.
6. An apparatus according to claim 1 wherein one or more of the actuation means, the display means and/or the calculation means are movable about the course.
- 20 7. An apparatus according to claim 1 wherein two or more of the actuation means, the display means and the calculation means are collectively packaged and carried with the second group.
8. An apparatus according to any one of the preceding claims wherein the groups include one or more golfers and the course is a golf course.

9. An apparatus according to claim 1 wherein the actuation means is located at the predetermined location and the display means is disposed at or adjacent to the location for displaying information indicative of the time interval when the second group is proximal to the display means.
- 5 10. An apparatus according to claim 1 including a plurality of actuation means which are disposed at respective predetermined locations spaced apart on the golf course.
11. An apparatus according to claim 1 or 10 wherein the locations are passed by the groups during the normal course of play.
12. An apparatus according to claim 1 or 10 wherein each location is at one of a
10 respective: tee; green; fairway; between a green and a tee; or on a pathway traversed by the groups during the normal course of play.
13. An apparatus according to claim 1 or 10 wherein the calculation means includes a timer for generating the time signal and transmitter means for communicating the time signal to the display means.
- 15 14. An apparatus according to any one of the preceding claims wherein the indication of the time interval provided by the display means includes an indication as to whether the time interval is within a predetermined acceptable range.
15. An apparatus according to any one of the preceding claims wherein the indication of the time interval provided by the display means includes a quantification of the time
20 interval.
16. An apparatus according to claim 1 wherein the display means is fixedly disposed at or adjacent to the location.
17. An apparatus according to claim 1 wherein the display means is movable and carried by or moves with the second group.

18. An apparatus according to claim 1 wherein the display means is integrated with an electronic score card.
19. An apparatus according to claim 1 including a locating device for determining the position of the second group and the time elapsed since the first group was at that position.
20. An apparatus according to claim 19 wherein the locating device is a GPS unit.
21. An apparatus according to claim 1 wherein the actuation means includes an input device for providing actuating signals upon the arrivals of the groups at the location.
22. An apparatus according to claim 21 wherein each group comprises one or more members and the input device includes a button operable by one of those members.
23. An apparatus according to claim 21 wherein the input device automatically senses the presence of each group.
24. An apparatus according to claim 23 wherein the input device is selected from one or more of the following: a force sensor such as a pressure pad or vibration sensor; an electromagnetic wave sensor; and/or an ultrasonic transducer.
25. An apparatus according to claim 1 or 10 including a central unit wherein the actuating units have communication means for allowing the transmission to the central unit of information indicative of either the time interval or the actuating signal.
26. An apparatus according to claim 23 wherein the groups include respective identification devices and the input devices are responsive to the identification devices for providing the respective actuating signals.
27. An apparatus according to claim 26 wherein the identification devices contain data in an electronic or magnetic form and the input devices include a respective electronic or magnetic reader for reading the data.

28. An apparatus according to claim 26 wherein the identification devices are selected from the following: magnetic keys; SMART cards; swipe cards; or radio transponders.

29. An apparatus according to claim 23 wherein the identification devices are
5 transponders which are mounted to respective golf carts.

30. An apparatus according to claim 1 or 29 wherein the display means are mounted to respective carts.

31. An apparatus according to claim 26 wherein the identification device also functions as an electronic score card.

10 32. An apparatus according to claim 31 wherein the identification device is a hand held radio transmitter which includes a keypad for the golfers in the respective group to enter their scores for the hole just completed.

33. An apparatus according to claim 32 wherein the data, once entered, is transmitted to a central processing site.

15 34. An apparatus according to claim 33 wherein the timing of the transmission is used by the actuation means to effect generation of the actuating signal.

35. An apparatus according to claim 1 wherein the calculation means and the display means are located adjacent to the location.

36. An apparatus according to claim 1 wherein the calculation means and the display
20 means are collectively packaged and are carried by or move with the second group.

37. An apparatus according to claim 1 wherein one person in the respective groups, upon reaching an actuation means, enters a previously allocated unique identifying number before an actuating signal will be generated.

38. An apparatus according to claim 1 wherein the actuation means, the calculation means and the display means are contained within a single housing.

39. An apparatus according to claim 38 wherein the housing is movable and is carried by or follows the second group as they progress about the course.

5 40. An apparatus according to claim 39 including a GPS unit for providing positioning information and for actuating the actuating means when the group is at or adjacent to the predetermined location.

41. An apparatus according to claim 1 wherein the first group is following a third group around the course and the display means provides an indication of the time
10 interval between the third group and the first group arriving at the location.

42. An apparatus for monitoring a first group of people and a second group of people, the apparatus including:

a central unit;

a plurality of actuating means being disposed at respective spaced apart locations
15 remote from the central unit for providing both respective first signals in response to the first group of people being at or proximal to the respective locations and respective second signals in response to the second group of people being at or proximal to the respective locations;

calculation means being responsive to the respective first and second signals for
20 generating a third signal indicative of the time interval between the groups being at or proximal to the respective locations;

communication means for allowing transmission of one or more of the first, second and third signals between the central unit and one or more of the actuation means;

indicator means being responsive to the third signal for providing information indicative of the time interval.

43. An apparatus according to claim 42 wherein said indicator means is a display means.

5 44. An apparatus according to claim 42 or 43 further including an alarm adapted to provide a warning if the time interval falls above a predetermined threshold.

45. An apparatus according to any one of claims 42 to 44 wherein each actuation means includes an alarm and the central unit is responsive to the third signal for determining whether the time interval falls above a predetermined threshold and, if so,
10 communicates a fourth signal to the respective actuation means to actuate the alarm.

46. An apparatus according to claim 45 wherein the alarm is audible.

47. An apparatus according to claim 45 wherein the alarm is visual.

48. An apparatus according to claim 45 wherein the alarm is both audible and visual.

49. An apparatus according to claim 42 wherein the calculation means includes a
15 plurality of separate timing devices located at respective actuation means.

50. An apparatus according to claim 42 wherein use is made of a single timer device.

51. An apparatus according to claim 50 wherein the single device is located at the central unit.

52. An apparatus according to claim 50 wherein the single device is located at one of
20 the actuation means.

53. An apparatus according to any one of claims 42 to 52 wherein the display means includes a plurality of displays located at or adjacent to respective actuation means to allow the group proximal to that actuation means to view the information indicative of the time interval.

54. An apparatus according to any one of claims 42 to 53 wherein the display means includes a display at or adjacent to the central unit.

55. An apparatus according to any one of claims 42 to 54 wherein the central unit is an actuating means.

5 56. An apparatus according to any one of claims 42 to 55 wherein said actuating means includes a detection means adapted to detect the movement, or replacement, of a marker.

57. An apparatus according to claim 56 wherein said detection means is a mechanical switch.

10 58. An apparatus according to claim 56 or 57 wherein said marker is a tubular flag stick.

59. An apparatus according to any one of claims 56 to 58, wherein said detection means includes two spaced apart contacts having an electrical potential maintained between them, said contacts being maintained in electrical contact whilst said marking is
15 in a resting position, said electrical connection being broken when said marker is removed from said resting position.

60. An apparatus according to any one of claims 54 to 59 wherein calculation circuitry and said display means are each mounted to said marker.

61. An apparatus according to claim 1 or 42 wherein said display means is adapted to
20 be disposed remote of said locations.

62. A method for establishing playing patterns of groups of golfers as they proceed around a golf course, the method including the steps of:

- a) providing a plurality of actuating means at points on the golf course which are passed by the groups in the normal course of play, each of the

- 40 -

actuating means including an input device to automatically sense the passing or close proximity of groups of golfers;

b) providing a plurality of calculating means which include timing means and which are responsive to the actuating means;

5 c) allowing the groups to progress around the course such that the actuating means automatically senses the arrivals of successive groups of golfers;

d) as a particular group approaches a location on the course at which the actuating means is arranged to generate an actuating signal, calculating
10 the time interval for the particular group with reference to a group immediately preceding the particular group under consideration; and

e) determining a playing pattern of the particular group based upon the time intervals.

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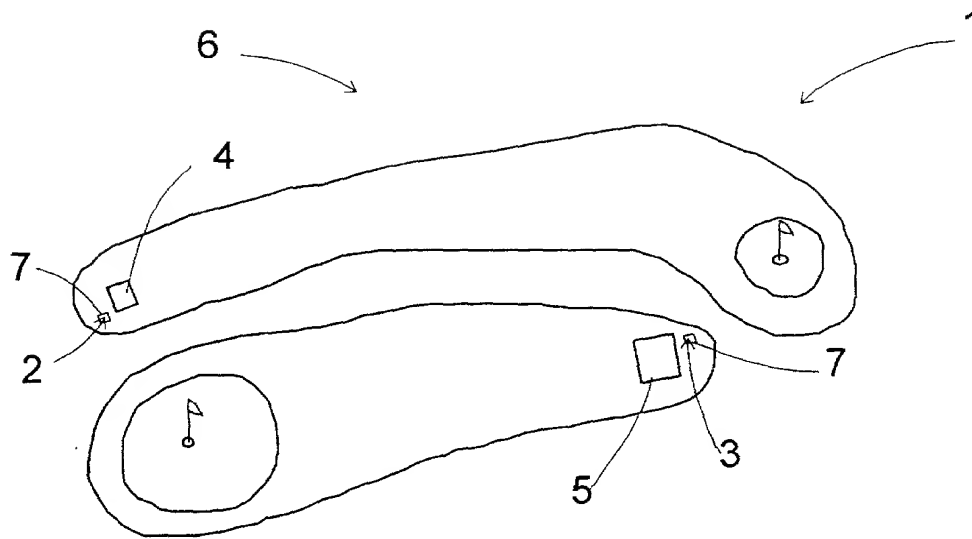


Figure 1

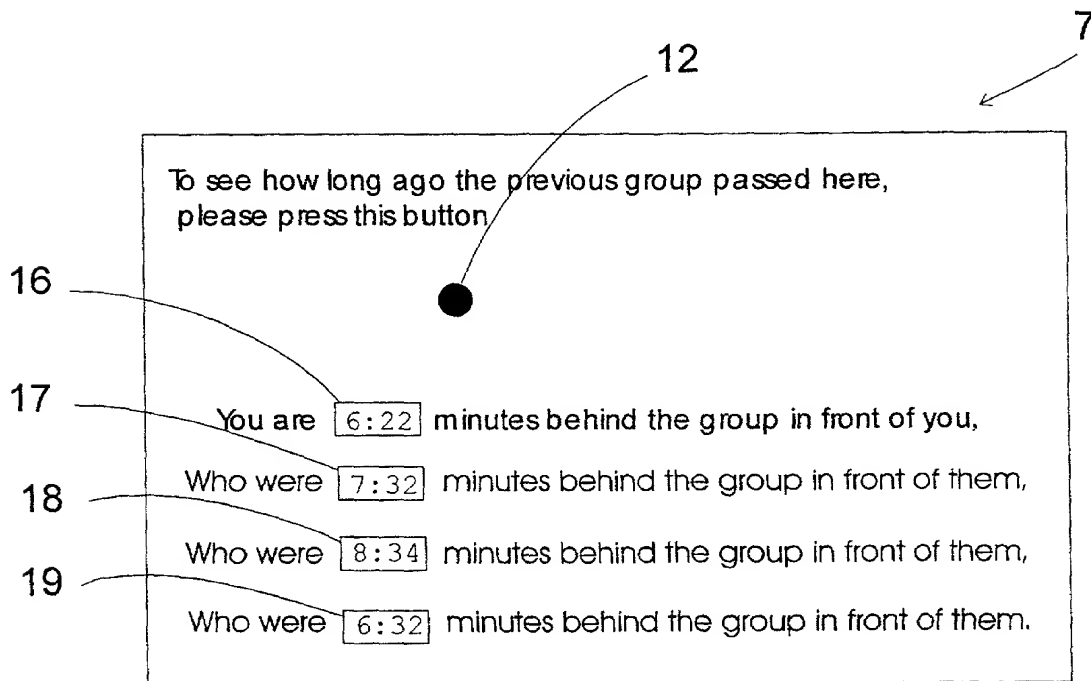


Figure 2

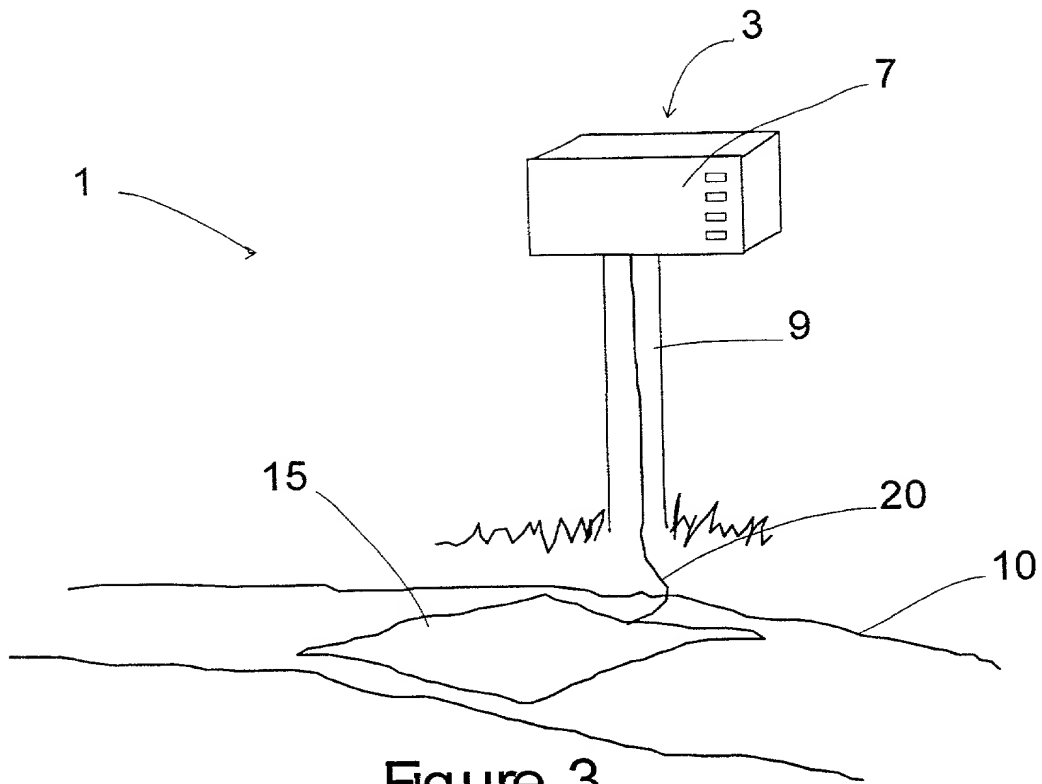


Figure 3

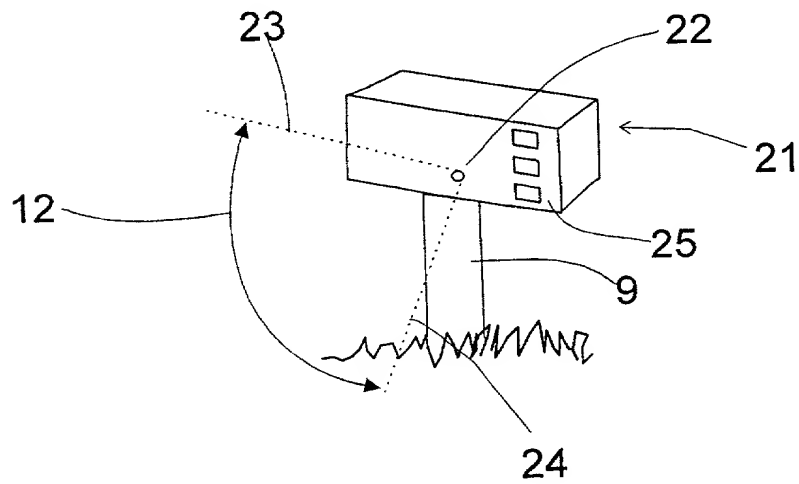


Figure 4

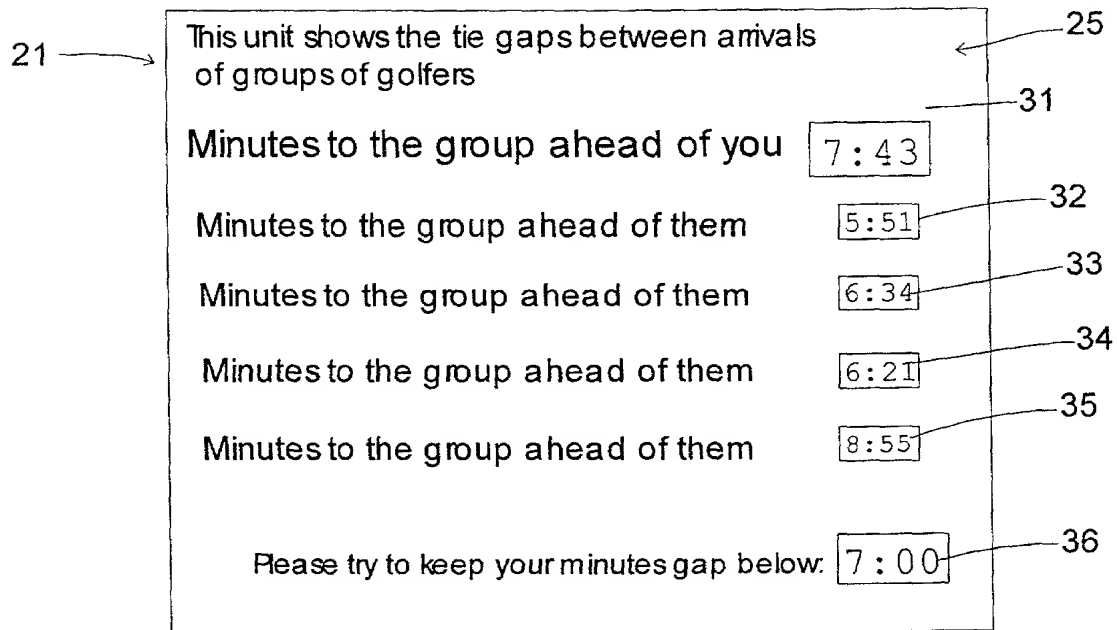


Figure 5

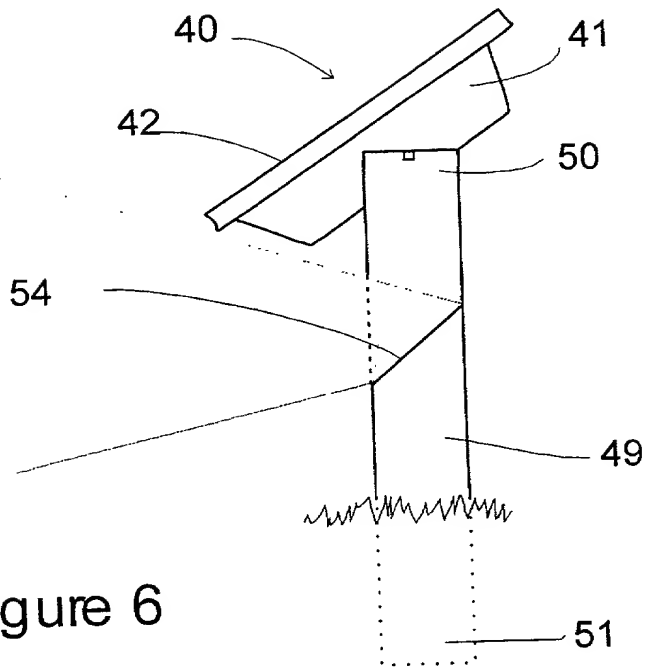


Figure 6

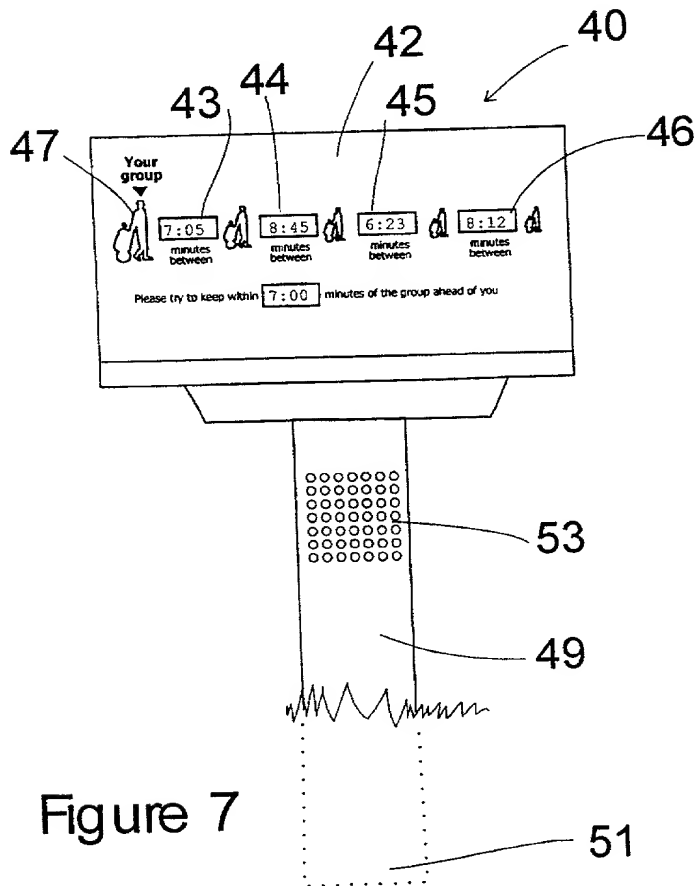


Figure 7

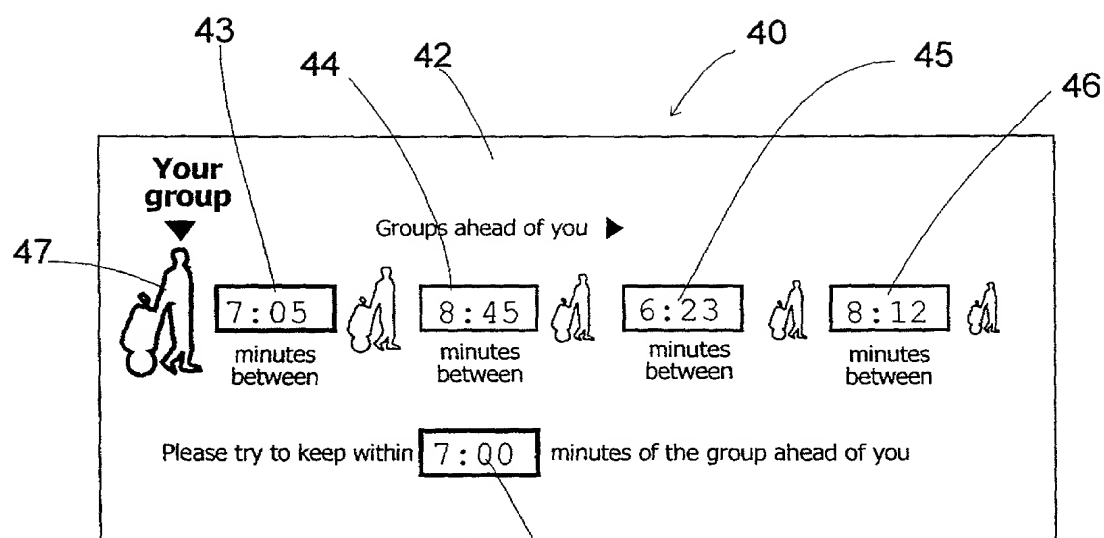


Figure 8

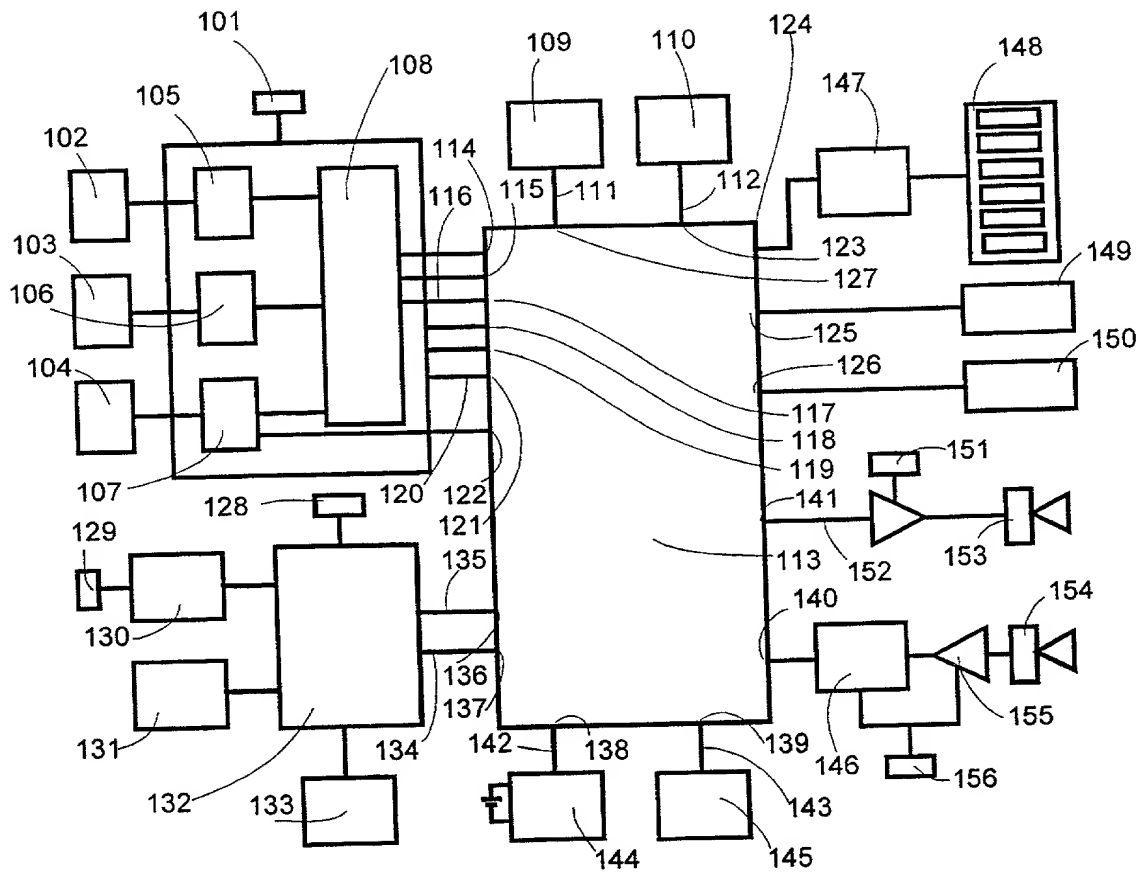


Figure 9

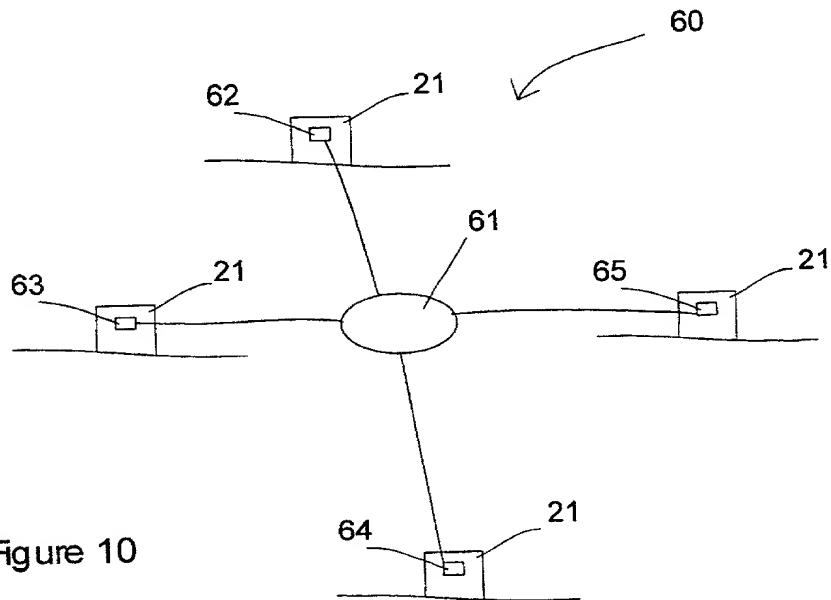


Figure 10

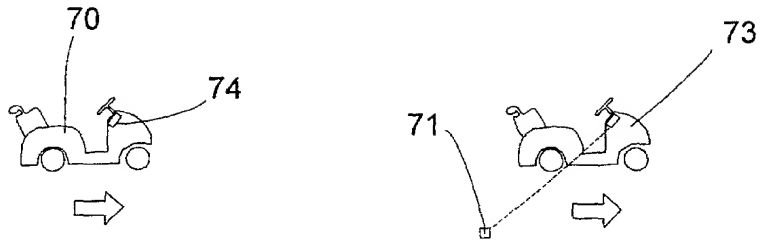


Figure 11

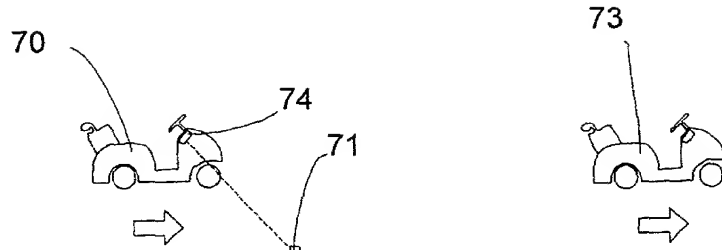


Figure 12

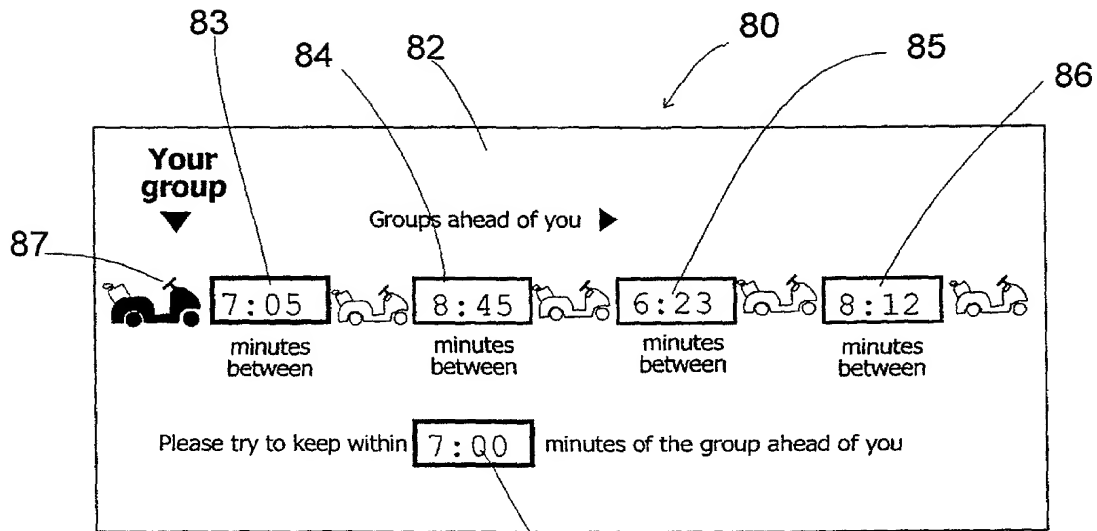


Figure 13

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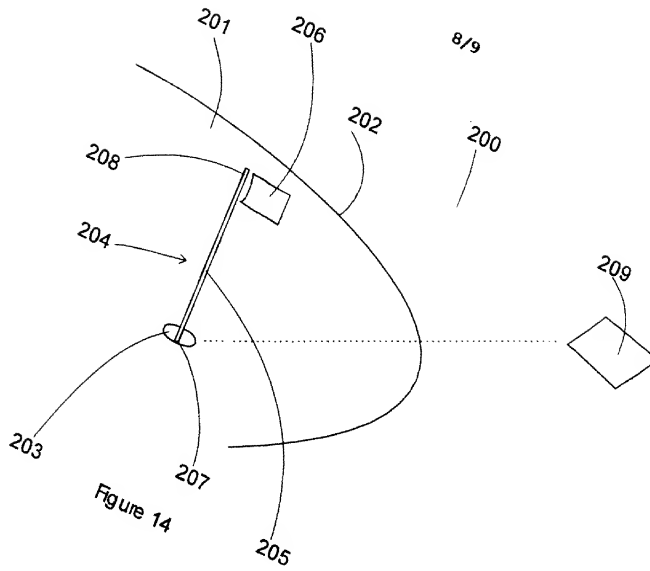


Figure 14

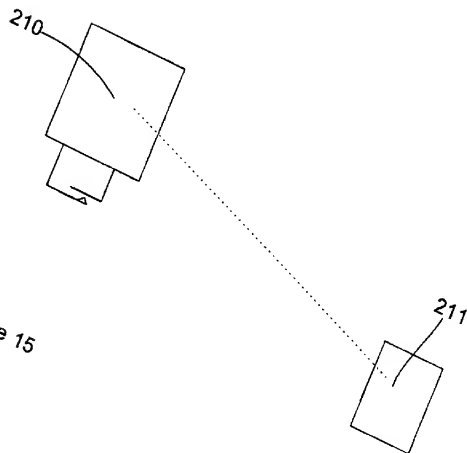


Figure 15

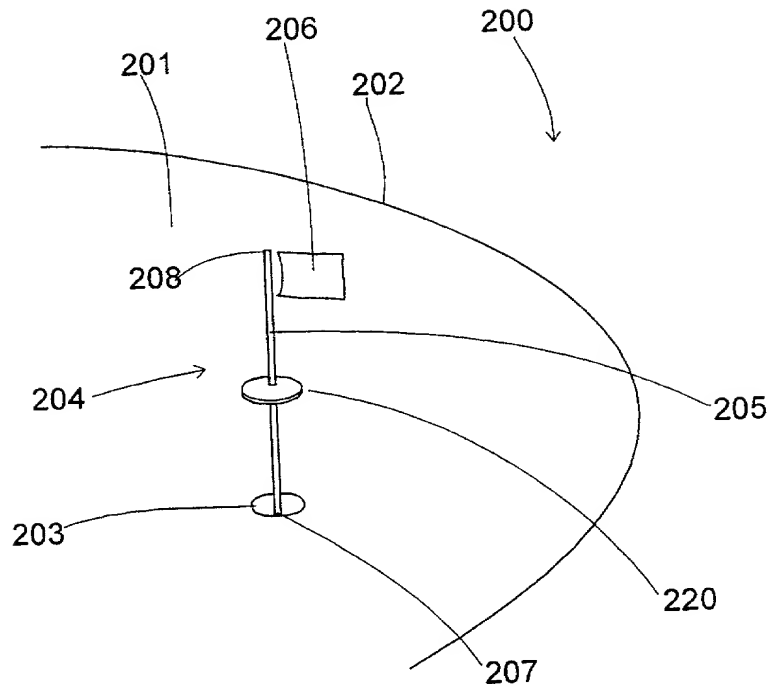


Figure 16

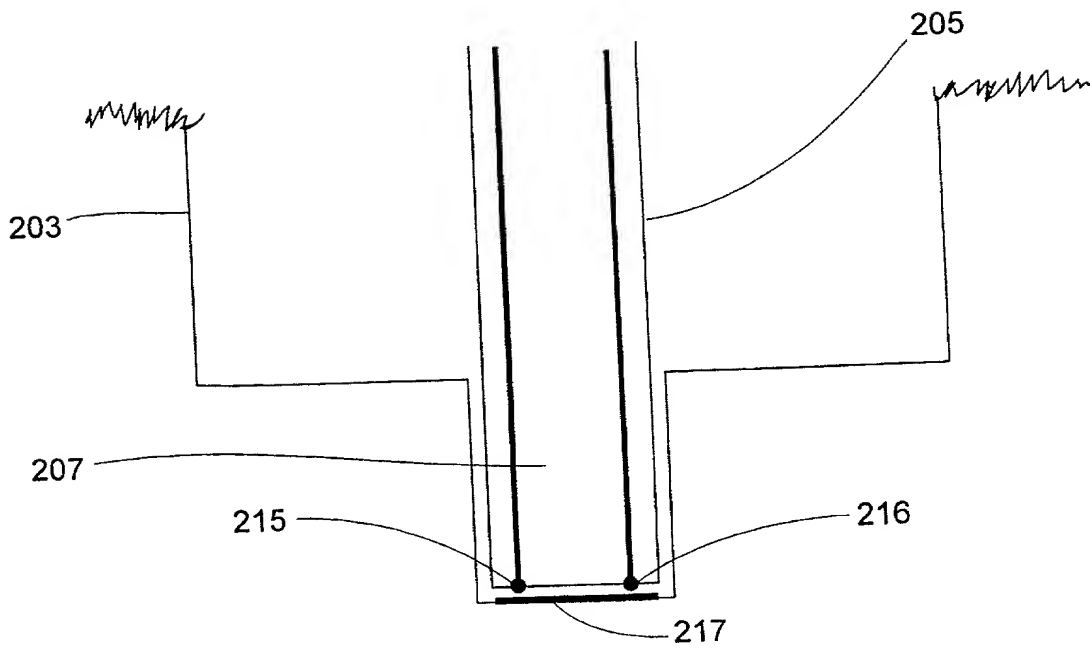


Figure 17

<p align="center">DECLARATION AND POWER OF ATTORNEY FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)</p> <p><input type="checkbox"/> Declaration Submitted with Initial Filing <input checked="" type="checkbox"/> Declaration Submitted after Initial Filing</p>	Attorney Docket No.	2495-105
	Named Inventor	Patrick McCULLAGH
	COMPLETE IF KNOWN	
	Application Number	09/786,233
	Filing Date	02 March 2001
	Group Art Unit	
	Examiner Name	

As a below named inventor, I hereby declare that:

My residence, mailing address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: INDICATING THE TIME INTERVAL BETWEEN GROUPS OF GOLFERS, the specification of which is was filed on 02 March 2001 as United States Application Number 09/786,233.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Numbers	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached?	
				YES	NO
PCT/AU99/00729	PCT	09/06/99	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PP 5659	Australia	09/04/98	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PP 7393	Australia	11/30/98			
PQ 2466	Australia	08/26/99			

I hereby claim the benefit under 35 U.S.C. 119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date (MM/DD/YYYY)

I or we hereby appoint the registered practitioner(s) associated with Customer No. 6449 to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith. Direct all correspondence to Customer Number 6449.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

NAME OF SOLE OR FIRST INVENTOR:		<input type="checkbox"/> A petition has been filed for this unsigned inventor	
Given Name (first and middle [if any]) <u>Patrick</u>		Family Name or Surname <u>McCULLAGH</u>	
Inventor's Signature <u>pmcCullagh</u>		Date <u>24/5/01</u>	
Residence: City <u>Killara</u>	State <u>NSW 2071</u>	Country <u>Australia</u>	Citizenship <u>Australia</u>
Mailing Address <u>65 Spencer Road</u>			
Mailing Address			
City <u>Killara</u>	State <u>NSW 2071</u>	Zip	Country <u>Australia</u>